By the use of the range table it was found what was the experimental elevation and time of flight for each of the ranges obtained by calculation.

The results of calculation and experiment are given in the following table. In column 1 the calculated ranges are specified. In columns 2 and 3 the calculated and experimental corresponding times of flight are given, and in column 4 the differences of these quantities. In columns 5 and 6 the calculated and the experimental elevations are given, and in column 7 their differences, which are due to the "jump" of the gun and to the "vertical drift" of the elongated shot. The calculated horizontal remaining velocity (column 8) is given in each case in yards per second to facilitate the expression of the small errors in time, given in column 4, in yards of range.

By the use of the general tables the time of flight over each range and the horizontal remaining velocity have been calculated (see columns 10 and 9), supposing the shot in each case to start with the horizontal muzzle velocity, and to move through air of a density corresponding to the mean height to which the shot actually rises.

Range.	Time of flight.			Elevation.			Calculated horizontal remaining velocity.	General tables	
	Calc.	By R. T.	Diff.	Calc.	By R. T.	Diff.		Rem. vel.	Time.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Yards.	Secs.	Secs.	Secs.	°	° ′	′	y. s.	y. s.	Secs.
1053	1·92	1·90	+0·02	1	0 52	+ 8	479	478	1·92
1831	3·72	3·77	−0·05	2	1 56	+ 4	391	390	3·73
2433	5·36	5·44	- 0·08	3	2 58	+ 2	343	345	5·38
2937	6·86	7·00	−0·14	4	3 56	+ 4	322	322	6·89
3386	8·30	8·41	−0·11	5	4 53	+ 7	305	304	8·33
3797	9·64	9·77	−0·13	6	5 51	+ 9	293	289	9·73
4148	10·95	11·04	−0·09	7	6 44	+16	278	278	10·98
4467	12·21	12·23	−0·02	8	7 35	+25	265	268	12·15
4813	13·46	13·57	−0·11	9	8 36	+24	258	258	13·48
5110	14·66	14·74	−0·08	10	9 33	+27	249	250	14·66
5384	15·84	15·84	0·00	11	10 28	+32	242	242	15·81
5664	17·01	16·95	+0·06	12	11 25	+35	234	235	16·98
5924	18·14	18·10	+0·04	13	12 20	+40	227	228	18·12
6170	19·29	19·18	+0·11	14	13 12	+48	220	222	19·24
6398	20·40	20·29	+0·11	15	14 5	+55	214	217	20·30
6632	21·53	21·46	+0·07	16	15 0	+60	208	212	21·41
6821	22·58	22·51	+0·07	17	15 46	+74	203	207	22·34
7003	23·62	23·52	+0·10	18	16 33	+87	198	203	23·26
7221	24·75	24·71	+0·04	19	17 33	+87	192	199	24·38
7483	25·94	26·10	−0·16	20	18 47	+73	188	193	25·75

The very small differences in column 4 between the calculated and experimental times of flight for the full extent of the range table afford conclusive evidence of the accuracy of the coefficients of resistance derived from my experiments of 1867, 1868, and 1878–80.

F. BASHFORTH.

A Plea for an International Zoological Record.

BEING now for the second year one of the Recorders for our English "Zoological Record," I should like to offer a few remarks upon the disadvantages of the system of recording that prevails at present in England and abroad.

The first point to be noticed is the number of independent Records that are published. Chief among these are our *Zoological Record* and the *Zoologischer Jahresbericht*, published by the Zoological Station at Naples. Besides these there are several minor semi-private records which it does not concern us to enumerate.

The disadvantage of so many records is obvious. In the first place they are expensive, as the result of competition is to decrease the number of purchasers of each record, since comparatively few zoologists are able to purchase more than one of them. Secondly they are all in some way incomplete. Thus without going into great details it may be pointed out that the *Zoological Record* specializes upon systematic zoology, and as a result the portions devoted to animal morphology and embryology are all but useless, as a rule, to those interested in these subjects. Moreover, the systematic portion, being often undertaken by zoologists who are not professed systematists, does not appear always to give satisfaction to those it is intended to benefit. On the other hand the *Zoologischer Jahresbericht* leaves out systematic zoology entirely, which in many groups of animals cannot well be separated from other branches of study, and from the fact that it does not record palæontological papers, there are often omitted, at least in my two groups—sponges and echinoderms—many works of great morphological importance.

Some years ago a proposal was made by Dr. Dohrn and the staff of the Naples Zoological Station to unite the two records into one. The English part was to be entirely systematic, the Naples part was to be entirely morphological and physiological, and both were to be published together as parts of one record. This most excellent proposal was refused by the British zoologists, owing, apparently, to a desire to gain exclusive honour for British nationality.

I wish now to propose that this long-delayed project should be carried out, and that in future one International Zoological Record should be published. Such a record should fall into two natural parts: (1) a morphological and physiological part, and (2) a systematic part; each with its own chief editor. Seeing now that Naples is a recognized centre for zoological research, and that a modern zoologist's education is scarcely complete until he has studied there, the first part of the Record could best be done there much on the lines of the present *Jahresbericht*. On the other hand London, with the greatest systematic collection in the world and the addition of a perfect library, would naturally be the centre for the systematic part. The total result could be published in one volume, perhaps best at Leipzig, and the systematic part would be in English, while the morphological part could be in English, French, German, or whatever might be the language of the recorder, as it is now in the Naples *Jahresbericht*.

I think the advantages of such a scheme are obvious. By the combination the labour of recording would be enormously lessened, and the combined record need not be much more expensive than either one of the two now existing. At the same time authors could be encouraged to send in abstracts of their own works to one of the two editors. This would be an advantage in every way. In the first place authors would be sure of seeing a proper abstract of their papers published. I am sure it must be the experience of many who have published a memoir and afterwards read the abstract of it, that the abstract often gives a shockingly mutilated account of the results set forth in the original paper. By the omission of a qualifying phrase or sentence, an author's results are often made to appear in abstracts as absolute rubbish. I speak as one who has suffered.

On the other hand, the work of the recorder would be still further lightened by authors sending abstracts of their own works. It might be left to the editors' discretion to cut down an abstract if it was too long.

I feel confident that a scheme of combined records such as I have sketched out would cheapen the production of the Record to such an extent, that, amongst other things, it would be possible to pay a special recorder of the literature, that is to say, a person whose business it would be to go through all the periodicals and sort out the papers amongst the different recorders, as is actually done by the editor of the *Naples Jahresbericht*. In the present system of the English *Zoological Record* each recorder has to go through the whole of the periodicals, and if the group be a small one, *e.g.* sponges, the labour of searching for papers is out of proportion to the task of recording them. Moreover, it necessitates a longer or shorter residence in London near the British Museum Library, which may cost a recorder *more than he is paid* for his share of the Record. The duties of a recorder of the literature would be best undertaken by some one residing near the British Museum, as he could then get all the periodicals. During my residence in Naples last year I was unable to obtain all the periodicals in the enormous list of the *Zoological Record*, and thus I was obliged to leave out of my *Sponge and Echinoderm Record* for 1890 a great many papers which I am recording now for 1891.

A great need at the present moment is the intelligent organization of scientific research, and I venture to suggest the above

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scheme as an improvement upon the present organization as far as the recording of zoological literature is concerned. Perhaps in the far distant future a record of geology and botany might further be incorporated in the above scheme, to make an "International Record of the Progress of Biological Science." It is scarcely to be hoped, however, that we are within a measurable distance of such a convenience. Would it not be a reasonable thing that the Royal Society of London should initiate such a progress in the recording of scientific literature as that here advocated?

E. A. MINCHIN.

University Museum, Oxford, August 2.

Pilchards and Blue Sharks.

YOU may like to know that the pilchards in coming in on the Cornish coasts this season are followed by great quantities of blue sharks (*Squalus glaucus*) from four to nine feet in length.

Just now they are hanging about four or five miles from land, and evidently are disturbing the pilchards in their feeding very much, as they are not scattering and playing on the surface of the sea in the evening twilight as they usually do, but are keeping in closely-packed schools throughout the night; hence our fishermen are having a very uncertain time of it as the consequence, some boats having rather heavy catches, and others only a few hundred of fish. And all are complaining of the damage done to the nets by the sharp teeth of these monsters, as in attacking the pilchards in the fishermen's nets, there is no hesitancy on the part of the sharks, for the net is bitten through and carried off with the pilchards. Last Friday morning the fishing-boat *Wave* landed seven of these sharks, and the master said, had he desired it, he could have caught a dozen, or more.

MATTHIAS DUNN.

Mevagissey, Cornwall, August 16.

Aurora Borealis.

STANDING by the Hampstead Heath flagstaff last Friday evening (12th), a few minutes before ten, I witnessed a feeble but characteristic display of the Aurora Borealis. Looking to the north-west, and midway between Ursa Major and the horizon, was a speck of pale bluish-green luminousness. While wondering as to the cause, a flickering shaft of crimson-tinted light shot upward in the direction of the "Pointers." This was followed by other streamers and "glows," sometimes white, sometimes slightly coloured. Occasionally patches of hazy light would be formed, through which the stars could be seen, and once a number of horizontal bands or waves passed upward from the horizon in quick succession, travelling almost to the star G in Ursa Major before they faded away. At 10.20 p.m., when I left the spot, the streamers had apparently ceased, but the sky was still luminous. Throughout the display was very faint and the colours very weak—mere tints.

A. BUTCHER.

ON Friday evening, August 12th, between the hours of nine and ten p.m., there was visible here a magnificent display of the aurora borealis. The streamers were very bright at times, and those on each extreme were more or less reddish. I think it worth recording because of the unusual time of year for such a display. It was doubtless seen over a wide region, and the telegraph system may have had some experience of earth currents.

EDMUND MCCLURE.

Mundesley, Norfolk, August 13.

AN active aurora of great brilliancy was visible here on Friday night from nine till ten p.m. The whole realm of the sky from north-west to north-east and from horizon to zenith was filled with a vaporous and highly luminous mass with streamers and rays, the light sufficing for reading moderately large type. The streamers and rays were projected from the upper edge of an arch of dark-coloured vapours resting on the northern horizon. The sky space occupied by the points of the streamers covered the constellation Ursa Major on the west, Cassiopea on the east, and the intermediate region. Among the brilliant sheaf of white streamers an occasional dark-coloured ray shot upwards from the generating arch.

J. LLOYD BOZWARD.

Worcester, August 13.

Aurora Australis.

A FRIEND (Mr. Hamilton S. Dove) who has resided for several years in Tasmania having sent me a full account of an unusually splendid aurora recently observed by him, but which met with little notice even locally, I enclose a condensed description of it, thinking it worthy of record in your columns. In previous occurrences of Southern Aurora he had observed "only a greenish yellow light, and was very much surprised at the grand fiery-red cloud-like patches, which formed so striking a feature in this phenomenon."

WILLIAM WHITE.

The Ruskin Museum, Sheffield.

"On the night of Wednesday, May 18th, 1892, a grand display of aurora was witnessed by us in the Calder district, near the township of Wynyard, Table Cape, North-west Tasmania. The sun had set at about ten minutes to five, and the night was very clear and cold—no clouds were to be seen—with a keen frosty wind blowing from the south-west. Shortly after seven o'clock a bright light was visible above the southern horizon, somewhat similar to the light preceding sunrise. Then two broad zones of greenish light appeared, extending from the south-east to the south-west, in the form of a depressed arch, one zone being a short distance above the other, like the bands of a rainbow. At times parts of these bands faded, whilst other parts became brighter. Presently some patches of a dark-red colour, as of illuminated sunset clouds, began to appear above the zones of greenish light, spreading along, but with intervals between, the whole expanse of the zones—one specially large and deep red patch being conspicuous in the extreme south-west. These patches glowed and faded alternately in the same manner as the zones of greenish light.

"After continuing for the space of about half an hour the coloured lights gradually faded, leaving the strong whitish light which appeared at first. Towards nine o'clock, however, a further manifestation occurred, beginning with a brilliant red light in the south-east, and extending from the horizon to a considerable distance upward, resembling the glow from a huge fire. This also paled and brightened, till presently the two broad zones of greenish light again appeared, this time, however, confined chiefly to the south and south-east heavens, very little reaching south-west. After this reappearance of the zones some broad white stripes commenced to radiate from the horizon, crossing the zones more than half the way upwards to the zenith. The stripes began to appear near the red glow in the south-east, and several others occurred south-east by south, only two rather faint ones being to the west of south.

"Almost directly one of the white stripes appeared one of the red cloud-like patches came to the east of it, and gradually extended towards it, so that the sky above the zones of greenish-yellow light was eventually covered with red glowing patches and pale vertical stripes, which similarly paled and brightened.

"The later appearances, like the first, lasted for about half an hour and then disappeared, the moon rising soon afterwards.

"H. S. DOVE.
"G. W. EASTON."

Units Discussion at British Association.

REFERRING to the preliminary memorandum printed in your issue of August 4th, page 334, I wish to correct a slip in the statement about the fall between two surfaces joined by a "weber." I ought to have added, "if their area is one square centimetre." Enlargement of the area to a metre would diminish the pull to 40 tons. Also I may observe that at the meeting I did not press all the proposed resolutions, but withdrew Nos. 4, 5, 6, and 8.

OLIVER J. LODGE.

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